

FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

April 19-20, 2018
Nashville, TN

Energy Resilience in FAA: Lessons Learned from Puerto Rico

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Hosted by:



Standard FAA Energy Resilience

- The FAA ensures Energy Resilience with a blend of utility, standby engine-generators (E/Gs) for essential systems, and uninterruptible power systems for critical systems.
 - Typical power configuration for FAA facilities providing services to the flying public.

Safety of the flying public is always priority #1.

Hurricane Maria Impacts to FAA

- Hurricane Maria devastated Puerto Rico and destroyed the utility system.
- Several FAA sites across the island have been without utility power since landfall.
 - Bulk of sites on E/Gs initially
 - Power grid restored to many sites
 - FEMA E/Gs have been deployed in absence of grid
 - Some sites require road repair for full restoration

Maria Impacts to Remote FAA

- On Pico del Este, critical surveillance and communication facility completely isolated:
 - Utility line was downed through the El Yunque National Forest
 - Utility transformer was overturned and damaged
 - Site on FAA E/G until FEMA E/G was deployed
 - Utility substation remains out-of-service
 - Road is currently under repair

Pico del Este



(Left)
Radar and
Comm Site



(Right)
Ridge
below Site

Long-term Restoration Issues

- Since September 20, 2017, utility power has been unavailable at the FAA facility.
 - Estimated utility line replacement cost is \$3,000,000 to \$5,000,000 (FAA responsibility)
 - Substation remains offline (utility responsibility)
 - FEMA E/G is operating 24/7 with standby FAA E/Gs (in case of FEMA E/G outage)
 - Without FEMA E/G, standby FAA E/Gs require biennial replacement

Concerns and Alternatives

- FAA Concerns:
 - Utility restoration uncertainty
 - Historically poor power reliability
 - High restoration costs
- FAA Alternatives:
 - Full-time E/G suite (i.e., five E/Gs arranged N+2)
 - Renewables and batteries alone
 - Renewables and batteries (primary) with E/Gs (standby)

Design Considerations

- FAA Services require 24/7 availability
- Solar PV must fit inside current FAA fence line
- Wind must be within 1.5 miles to retain site performance
 - Too far and generators interfere with surveillance
- Renewables and E/Gs must support simultaneous operations and battery charging
 - 200% minimum production per source

Proposed Structure Change



- Remove antenna towers Done - FAA
- Remove tower bases Done – FAA
- Remove trailer Done – Maria
- Reduce structure to one story Requested

Alternatives Issues

- Operating in El Yunque National Forest
- Full-time E/G suite (i.e., five diesel E/Gs)
 - Fossil-fuel emissions
 - Noise
- Renewables and batteries alone
 - Limited solar and wind
 - Oversized charging requirements
 - Very large battery complements to accommodate cloudy, still days

Selected Alternative

- Renewables and batteries with E/Gs (standby)
 - Conceptual operations (nominal)
 - Solar PV 10 am to 2 pm
 - E/G sets 2 pm to 10 pm
 - Batteries 10 pm to 10 am
 - Wind-based charging (when available)
 - Fossil-fuel emissions and noise reduced to 8 hours
 - Maximum use of solar and wind resources
 - E/Gs provide 100% standby (on cloudy, still days)

Status

- Completed
 - Site Survey
 - Conceptual Design
 - Market Survey
- Future
 - 100% Design
 - Assess DoE contract vehicles
 - Implementation (18-24 months)

Questions

